Sept. 16, 1947. N. H. KNOWLTON 2,427,357

MACHINE FOR EFFECTING RELATIVE MOVEMENT BETWEEN SHOES AND LASTS

Filed July 16, 1946 4 Sheets-Sheet 1

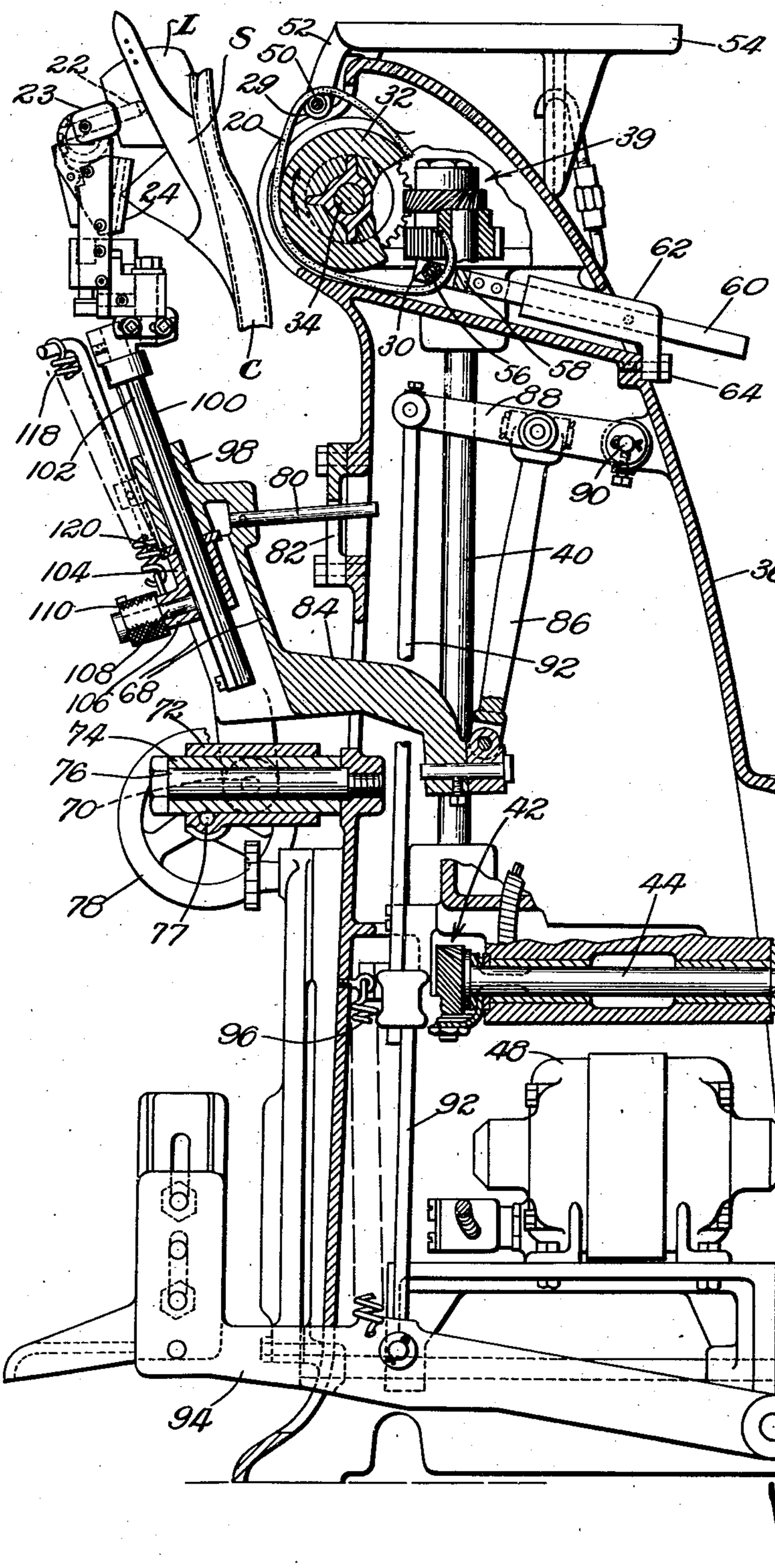

Fig. 1

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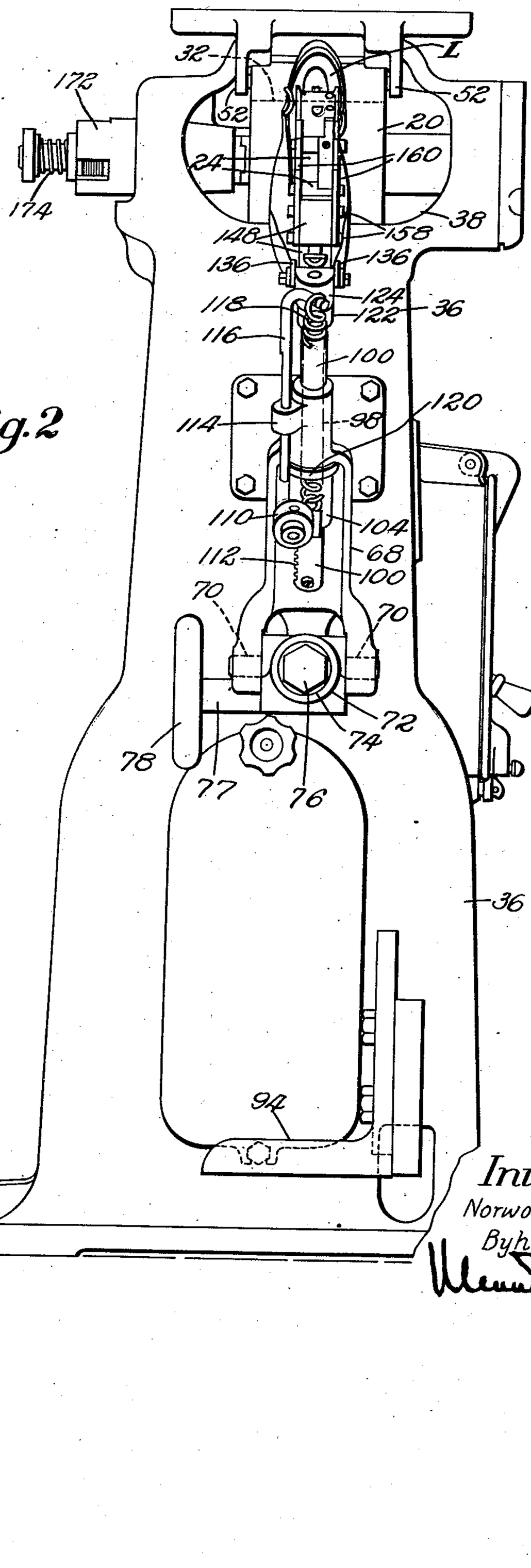

Fig. 2

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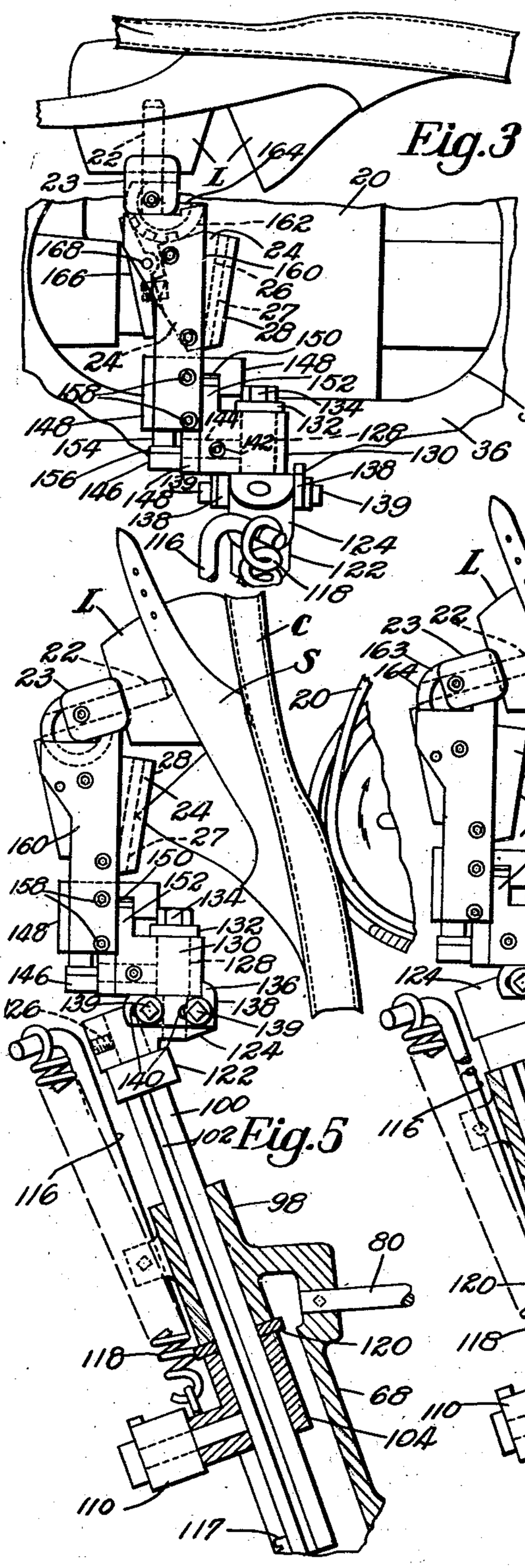

Fig. 3

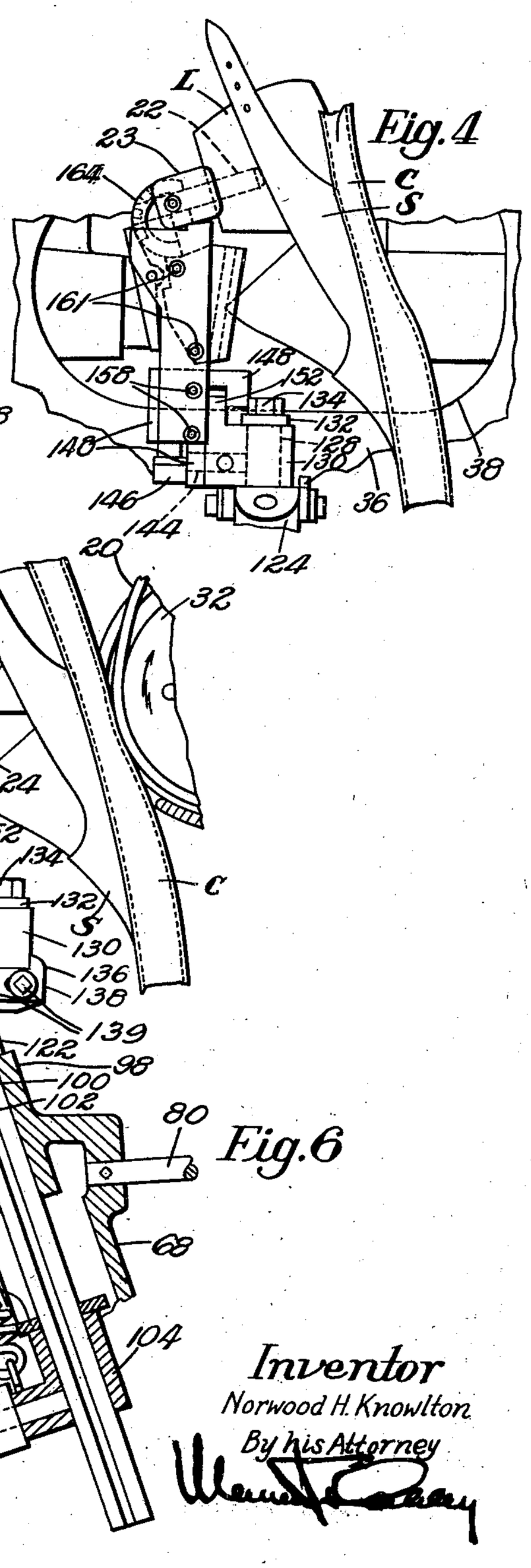

Fig. 4

Fig. 5

Fig. 6

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Filed July 16, 1946 4 Sheets-Sheet 4

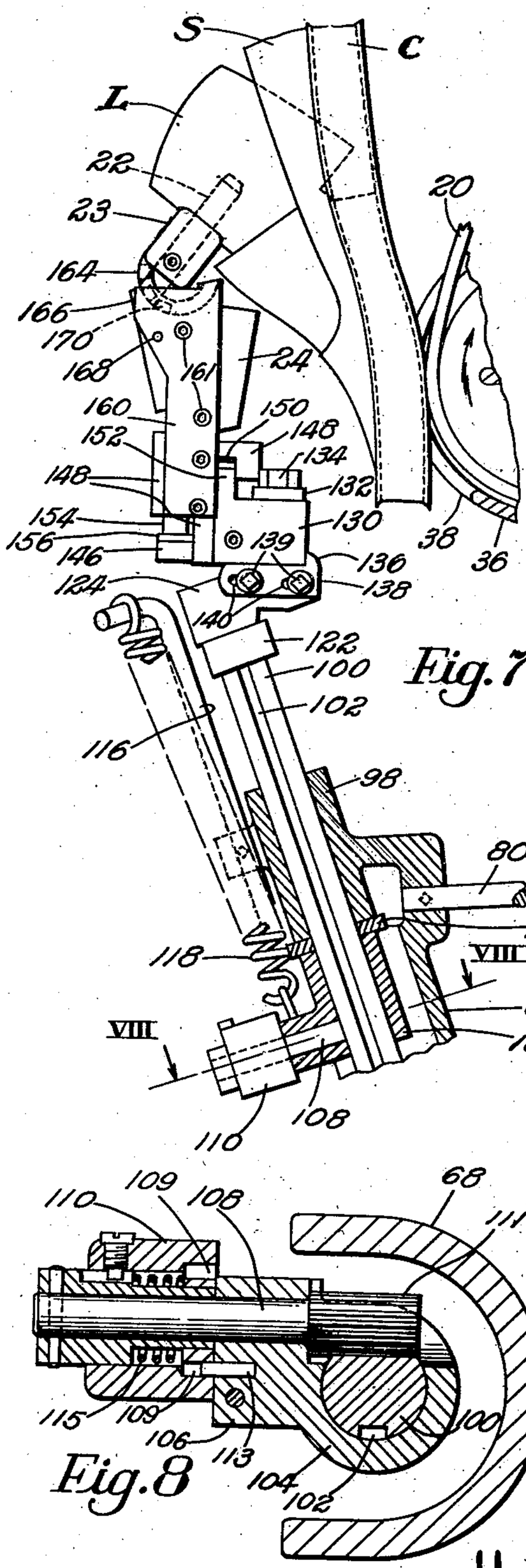

Fig. 7

Fig. 8

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MACHINE FOR EFFECTING RELATIVE MOVEMENT BETWEEN SHOES AND LASTS

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Application July 16, 1946, Serial No. 684,017

7 Claims. (Cl. 12—1)

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This invention relates to machines for effecting relative movement between shoes and lasts, and is herein disclosed as embodied in a machine for forcing shoes on lasts. The machine disclosed herein, like that disclosed in my co-pending application for United States Letters Patent Serial No. 605,149, filed on July 14, 1945, is provided with a treadle-operated last support by which the operator can bring the bottom of a shoe on a last carried by the last support into engagement with a driven friction tool. Also like that machine, the machine disclosed herein, while intended primarily for use upon shoes of the platform type, will be found convenient for operation upon shoes or other types and also for general use in relasting operations.

It is an object of the present invention to provide, in a machine of the type under consideration, and arrangement whereby the locality of operation of the friction tool against the bottom of the shoe can be varied at will. In accordance with a feature of the invention, the illustrated machine is provided with a last support constructed and arranged for movement to bring the shoe bottom into engagement with the friction tool and also for ready movement by direct manual pressure in a direction to vary the locality of such engagement lengthwise of the shoe bottom. As shown herein, the last support is mounted upon a slide which is normally held by a spring in a stop position from which it may be depressed manually by the operator to enable the locality of operation to be varied. The slide is guided in a bearing which is short enough to cramp the slide against longitudinal movement when the shoe is pressed against the friction tool. Such cramping of the slide holds it against the frictional force which the tool exerts against the shoe bottom. When the pressure of the shoe against the friction tool is released, the slide can move freely in its bearing. By the use of this device, the operator can conveniently cause the operation to take place first upon the forepart of the shoe bottom and then upon the shank portion.

In accordance with a further feature of the invention, the last support, as shown herein, may comprise a last pin capable of being secured in various angular positions to accommodate a straight last or a hinged last in its extended position or, on the other hand, to accommodate a collapsed last.

These, and other features of the invention, including certain details of construction and combinations of parts, will be set forth in connection

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with an illustrative machine and will be pointed out in the appended claims.

Referring now to the accompanying drawings,

Fig. 1 is a side elevation, in section, of an illustrative machine embodying the invention;

Fig. 2 is a front elevation of the machine;

Fig. 3 is an enlarged front elevation of a portion of the machine, showing the last support in loading position;

Fig. 4 is a view similar to Fig. 3 showing the last pin tilted down;

Fig. 5 is a side elevation of the upper portion of the machine showing the forepart of a shoe bottom engaging the friction tool;

Fig. 6 is a view similar to Fig. 5 showing the shank portion of the shoe bottom engaging the friction tool;

Fig. 7 is a view similar to Fig. 5 showing the last pin tilted to an intermediate position for use with lasts in collapsed condition; and

Fig. 8 is a sectional view taken on the line VIII—VIII of Fig. 7.

The work engaging instrumentalities of the illustrative machine comprise a friction belt 20 of rubber or other suitable friction material, a last pin 22 mounted for tilting adjustment, a pair of supports 23 rigidly connected to the last pin and having beveled inner faces engageable with the lateral edges of the cone of the heel portion of a last, and a block 24. The last pin 22 is adapted to engage the usual thimble hole of a last L upon which is loosely mounted a shoe S having a platform cover C to be turned down by a subsequent operation. It is adjusted in upright position to receive the last, and is then inclined to cause the toe of the shoe to point down, with the general plane of the shoe bottom but slightly inclined from the vertical. The block 24 (Fig. 3) has a channel-shaped portion comprising a base 26 cushioned by a leather pad 27 to form an abutment for engagement with the top of the forepart of the last L to sustain a thrust against the shoe botom, and a pair of side walls 28 which loosely engage opposite sides of the top of the forepart of the last to limit the turning movement of the last about the last pin 22. The machine is so organized as to enable the operator to urge the block 24 toward the belt 20 until the shoe bottom is engaged by the belt, whereupon the belt, which is driven while in frictional engagement with the shoe bottom, will urge the shoe upwardly upon the last.

The belt 20 (Fig. 1) is loosely mounted upon a pair of rolls 29 and 30, and it surrounds a rubber covered roll 32 secured upon a shaft 34 which

is journaled in suitable bearings formed in the upper portion of a hollow frame 36. An opening 38 (Fig. 2) is formed in the forward portion of the frame 36 to enable the shoe S to be brought into engagement with the belt 20. The shaft 34 is continuously driven in the direction indicated by the arrow in Fig. 1 through gearing 39, a vertical shaft 40, gearing 42, a horizontal shaft 44, gearing 46, and a motor 48. The roll 29 is mounted for free rotation upon a rod 50 which is secured between a pair of ears 52 depending from a shelf 54. The roll 30 is mounted for free rotation upon a rod 56 the ends of which are secured in a fork 58 carried by a rod 60 slidably mounted for purposes of adjustment in a guide bracket 62 secured by screw 64 (Fig. 1) to the frame 36. This arrangement for mounting the rod 56 enables it to be adjusted forwardly and rearwardly to provide as much or as little slack in the belt 20 as may be required. The rod 60 is clamped in its adjusted position by a setscrew (not shown). The belt 20, when not in use, rests lightly against the roll 32 and may be driven idly by such contact, but when pressed against the roll 32 by the shoe bottom it will be driven forcibly by the roll 32 and will, in turn, exert force against the shoe bottom in the direction indicated by the arrow in Fig. 1. The belt 20, the roll 32 together with its driving mechanism, and the frame 36 are all substantially like the corresponding portions of the machine disclosed in application Serial No. 605,149 above referred to.

The last pin 22 and the block 24 are mounted, through connecting members later to be described, upon a lever 68 having a forked lower end portion which is pivotally mounted upon a pair of trunnion pins 70 (Fig. 1) extending diametrically in a horizontal direction from a sleeve 72. Within the sleeve 72 is a sleeve 74 which, in turn, is freely rotatable upon a horizontal pin 76 secured in and extending forwardly from the front wall of the frame 36. The sleeve 72 is slidable forwardly and rearwardly, for purposes of adjustment, upon the sleeve 74 and it may be secured in any desired position of such adjustment by a clamping bolt 77 operated through a hand wheel 78. The lever 68 is maintained in an upright position and is prevented from rotating about the axis of the pin 76 by a pin 80 secured in and extending rearwardly from the lever 68 and engaging a longitudinal slot 82 formed in the front wall of the frame 36. The lever 68 has an arm 84 which extends rearwardly through an opening in the front wall of the frame 36 and which is pivotally connected to the lower end of a link 86 the upper end of which link is pivotally connected to a lever 88 fulcrumed upon a pin 90 secured to and within the frame 36. A treadle rod 92 pivotally connected at its upper end to the lever 88 and at its lower end to a treadle 94 enables the operator to swing the lever 68 rearwardly by depression of the treadle. A spring 96 normally holds the treadle in an upper stop position with the lever 68 swung outwardly away from the roll 32. The lever 68, together with its supporting and operating instrumentalities, is somewhat similar to the corresponding member disclosed in application Serial No. 605,149.

Formed in the lever 68 is a bearing 98 for guiding a slide 100 in a direction which is approximately radial with respect to the trunnion pins 70. The bearing 98 is just long enough to permit free running of the slide 100 under normal conditions, and it is short enough to cramp the slide against movement when any considerable force is exerted on the slide transversely of the direction in which the slide is movable. The slide 100 is conveniently circular in cross section and it has a longitudinal groove 102 engaged by a pin (not shown) secured to the bearing 98 for preventing rotation. Adjustably fixed upon the slide 100 below the bearing 98 is a collar 104. Journaled in a lug 106 extending from the collar 104 is a shaft 108 having keyed upon it a knurled collar 110 by which it may be turned. Gear teeth 111 (Fig. 8) formed on the shaft 108 mesh with rack teeth 112 (Fig. 2) formed on the slide 100 to provide for heightwise adjustment of the slide relatively to the collar 104. A pin 113 (Fig. 8) engageable with any one of a plurality of holes 109 in the knurled collar 110 locks the knurled collar positively in a desired position of adjustment. This adjustment can be varied by sliding the knurled collar along the shaft 108 to disengage it from the pin 113, whereupon the knurled collar can be turned to a new position of adjustment. A spring 115 yieldingly holds the knurled collar 110 in a position of engagement with the pin 113. Threaded into the slide 100 is a stop screw 117 (Fig. 5) to prevent excessive upward adjustment of the slide.

Secured in a lug 114 (Fig. 2) extending from the bearing 98 is a rod 116 which is substantially parallel to the slide 100. Secured at its upper end to a bent-over portion of the upper end of the rod 116 is a tension spring 118 the lower end of which is secured to the lug 106. The effect of the spring 118 is normally to hold the slide up as far as permitted by the engagement of the lower end of the bearing 98 with the upper end of the collar 104. As shown herein, a washer 120 of leather or like material may be interposed between the bearing 98 and the collar 104 to absorb shock. It is evident from the above description that the slide 100 is normally maintained in its uppermost position by the spring 118 and that this position may be adjusted heightwise by turning the knurled collar 110.

Secured upon the slide 100 adjacent to the upper end thereof by a set screw (not shown) is a collar 122. A block 124 is secured upon the slide 100 just above the collar 122 by a set screw 126 (Fig. 5). Securely fixed in the block 124 is an upstanding pin 128 upon which is pivotally mounted a block 130. A washer 132 is clamped against the protruding upper end of the pin 128 by a screw 134 threaded axially into the pin to retain the block 130 on the pin, while permitting free pivotal movement of the block 130. It will be noted that the axis of the pin 128 is inclined somewhat to the axis of the slide 100; the block 124 is accordingly provided with an inclined finished bearing surface, normal to the axis of the pin 128, for engagement with the finished under surface of the block 130 to permit free turning of the latter. The extent to which the block 130 may be turned to the right or left is limited by a pair of stop lugs 136 (Figs. 5, 6, and 7) formed on plates 138 which are clamped to the respective sides of the block 124 by screws 139. The plates 138 are provided with slots 140 to accommodate the screws 139 for different positions of adjustment of the plates. The side faces of the block 130 are plane and parallel and, when the block is turned far enough, they enter into stopping engagement with the lugs 136; the rearward end of the block 130, however, is rounded to avoid interference with the stop lugs.

Secured in the block 130 by a set screw 142 (Fig. 3) and having its axis normal to the axis

of the pin 128 is a pin 144 having a head 146, the upper portion of the head 146 being cut away. Pivotally mounted on the pin 144 and retained thereon by the head 146 is a lug depending from a block 148, the blocks 130 and 148 being provided with finished bearing surfaces to permit free turning of the latter. Extending upwardly from the block 130 into a slot 150 (Fig. 3) formed in the block 148 is a guide lug 152 for affording additional support to the block 148. A downwardly spring-pressed plunger 154 having a head 156 bears against a flat surface formed on the head 146 to hold the block 148 normally in an upright position from which it may yield right or left to forces applied manually by the operator upon the shoe and last. The pivotal mounting of the block 148, the provision for its additional support, and the arrangement for holding it yieldingly in upright position, are similar to corresponding features disclosed in application Serial No. 605,149.

Securely clamped to the side faces of the block 148 by screws 158 are a pair of parallel upwardly extending plates 160 (Figs. 2, 3, and 5) between which the block 24 is clamped by screws 161 (Fig. 7). On the upper inside portions of the plates 160 are formed a pair of arcuate guideways 162 (Fig. 3) having a common horizontal axis which is at right angles to, although not quite intersecting, the axis of the last pin 22. Between the upper end portions of the plates 160 and having arcuate lugs 163 (Fig. 6) which are slidable in the guideways 162 is a block 164. The last pin 22 is securely fixed in the block 164, and the last supports 23 are clamped in upstanding position to the side walls of the block 164 above the plates 160. The block 164 is freely rotatable in the guideways 162 and it may be secured in any desired position of rotation by a spring-pressed detent 166 (Fig. 3) fulcrumed on a pin 168 secured in the plates 160 and having a lug engageable with any one of a plurality of recesses 170 (Fig. 7) formed on the periphery of one of the arcuate slide lugs 163 of the block 164. The block 164 of the illustrated machine is provided with three such recesses, one for holding the last pin substantially upright, as shown in Fig. 3, one for holding it in a rearwardly inclined position which is nearly horizontal, as shown in Figs. 1, 4, 5 and 6, and one for holding it in an intermediate rearwardly inclined position, as shown in Fig. 7.

In order to enable the roll 32 to come to rest if excessive resistance is encountered during the operation, the shaft 34 is driven through a multiple plate clutch indicated generally on Fig. 2 by the reference numeral 172. The maximum torque which may be transmitted by this clutch can be adjusted by varying the compression of a spring 174.

In the performance of the operation, the last L is placed upon the last pin 22 with the last pin adjusted in upright position. For convenience this may be done with the block 130 turned about the pin 128 to one of its stop positions to bring the longitudinal axis of the shoe substantially parallel to the axis of the roll 32 as shown in Fig. 3. The toe end of the shoe, as shown in that figure, has been turned toward the right, and the left-hand side wall (not visible) of the block 130 is against the left-hand stop lug 136. The shoe may now be loosely mounted on the last by hand, with the heel strap left unbuckled. It may be noted that the last pin 22 of the present machine, when adjusted in its upright position, can thus be used for the preliminary placing of the shoe upon the last in place of the stationary last pin 126 of the machine disclosed in application Serial No. 605,149 and the stationary last pin may, therefore, be omitted in the present machine. The lateral supports 23 hold the last from turning about the last pin.

After thus mounting the shoe loosely on the last, the operator tilts the last pin to its lowermost inclined position, as shown in Fig. 4, and then swings the block 130 about the pin 128 to bring the shoe bottom into face-to-face relation with the friction belt 20; then he depresses the treadle 94, whereupon the bottom of the shoe is brought into engagement with the belt and rotation of the roll 32 is transmitted frictionally through the belt against the shoe bottom to force the shoe farther upon the last.

While the shoe is thus pressed against the friction belt, the block 130 may turn slightly to one side or the other about the pin 128 automatically to balance the pressure and insure even distribution of pressure on the opposite sides of the center line of the shoe, or the operator may manually exert a turning force upon the block, as has been pointed out in application Serial No. 605,149. It will be noted that, with reference to Fig. 5, the cone of the forepart of the last engages the pad 27 to hold the last against collapsing while the shoe is pressed against the friction belt and also that the side walls 28 hold the last against rotation about the last pin as has already been explained in application Serial No. 605,149. The pad 27 may hold the last away from the lateral supports 23, which are not needed when the side walls 28 hold the last from rotating about the last pin. The operation may thus be performed upon a hinged last in straight or extended condition and it is often convenient to perform it in this way when the shoes have open backs provided with only a heel strap.

Fig. 5 shows the forepart of the shoe bottom in engagement with the friction belt and with the slide 100 in its uppermost position. However, it is often desirable, after the toe end of the shoe has thus been urged on the last, to apply a frictional force upon the shoe bottom at the shank portion. This is readily accomplished by slackening the pressure upon the treadle and then pushing the lasted shoe down by hand against the tension of the spring 118. The operator can judge by eye just how far the shoe should be lowered, and, having brought it to the desired position, he bears down again on the treadle and brings the shank portion of the shoe into engagement with the friction belt as shown in Fig. 6. The pressure exerted through the treadle to urge the shoe against the roll also causes the slide 100 to cramp in its bearing 98 and thus to become locked against longitudinal or heightwise movement. The operator is thereby relieved of having to hold the shoe and last down against the upward frictional force which the belt 20 exerts upon the shoe bottom. When the shank portion of the shoe has been urged far enough upon the last, the operator releases the treadle, buckles the heel strap, and removes the last with the shoe properly mounted thereon.

For operating upon shoes with closed backs, it is usually convenient to keep the last in broken or collapsed condition as shown in Fig. 7. In such case the last pin 22 is adjusted in its intermediate tilted position before the machine is treadled to bring the shoe into engagement with the friction belt. The lateral supports 23 hold the last against turning about the last pin. After

the forepart and the shank portion of the shoe have been forced upon the last, the heel portion of the last may be inserted, with the aid of a shoe horn, into the heel portion of the shoe by straightening the last. This is conveniently done with the block 130 turned sidewise about the pin 128 to bring the shoe out of the way of the friction belt.

Having described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A machine for effecting relative movement between shoes and lasts comprising a support for a last, a driven friction tool engageable with the bottom of a shoe on the last, and a carrier for said last support constructed and arranged for movement to bring the shoe bottom into and out of engagement with the friction tool and also for ready movement by direct manual pressure in a direction to vary the locality of such engagement lengthwise of the shoe bottom.

2. A machine for forcing shoes on lasts comprising a support for a last, a driven friction tool engageable with the bottom of a shoe loosely mounted on a last on said last support, an extensible lever on which said last support is mounted, a support on which said lever is pivotally mounted for swinging movement toward and from the friction tool, and means for swinging said lever to bring the bottom of the shoe into and out of engagement with the friction tool, said lever being constructed and arranged to change its effective length in response to forces exerted by the operator as he grasps the partially lasted shoe, thereby enabling the operator to bring either the forepart or the shank portion of the shoe bottom at will into engagement with the friction tool.

3. A machine for forcing shoes on lasts comprising a support for a last, a driven friction tool engageable with the bottom of a shoe loosely mounted on a last on said last support, a slide on which said last support is mounted, a carrier having a guideway for said slide, a spring normally holding said slide in a stop position in said guideway, and means for moving said carrier to bring the bottom of the shoe into and out of engagement with the friction tool, the slide being displaceable in opposition to said spring to vary the locality of engagement of the shoe bottom with the friction tool.

4. A machine for forcing shoes on lasts comprising a last pin, a driven friction tool engageable with the bottom of a shoe loosely mounted on a last on said last pin, a slide on which said last pin is mounted, a lever pivotally mounted for swinging movement toward and from said friction tool and having a guideway for said slide, a spring normally holding said slide in a stop position in said guideway, a treadle, and connections from said treadle to said lever whereby the lever can be swung by depression of the treadle to bring the bottom of the shoe into engagement with the friction tool, said slide being manually displaceable in opposition to said spring to vary the locality of engagement of the shoe bottom with the friction tool.

5. A machine for forcing shoes on lasts comprising a support for a last, a driven friction tool engageable with the bottom of a shoe loosely mounted on a last on said last support, a slide on which said last support is mounted, a bearing for guiding said slide for longitudinal movement, said bearing being short to cramp the slide against longitudinal movement when a thrust transverse to the direction of said longitudinal movement is applied to the partially lasted shoe, and means for moving said slide to bring the bottom of the shoe into and out of operative engagement with the friction tool, said slide being readily movable in said bearing to enable the operator to position the shoe for engagement of either the forepart or the shank portion of the shoe bottom with the friction tool, said slide also being locked against longitudinal movement by the cramping action of the bearing when the shoe is pressed against the friction tool.

6. A machine for forcing shoes on lasts comprising a support for a last, a driven friction tool engageable with the bottom of a shoe loosely mounted on a last on said last support, a slide on which said last support is mounted, a bearing for guiding said slide, stop means for limiting the movement in one direction of the slide relatively to the bearing, means for adjusting said stop means to vary the position in which the stop means limits said movement, a spring for normally holding said slide in said limiting position, and means for moving said bearing to bring the shoe bottom into and out of engagement with the friction tool.

7. A machine for effecting relative movement between shoes and lasts comprising a support for a last, a driven friction tool engageable with the bottom of a shoe on a last on said support, means for effecting relative movement between the last support and the friction tool to cause operative engagement between the shoe bottom and the tool, and means for maintaining said last support in a predetermined angular position with respect to the tool, said maintaining means being adjustable to vary said angular position to accommodate lasts in either straight or collapsed condition.

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